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### A carriage for a stairlift assembly and a stairlift assembly

(57) A carriage for a stairlift assembly of the kind having a track relative to which the carriage is moveable.



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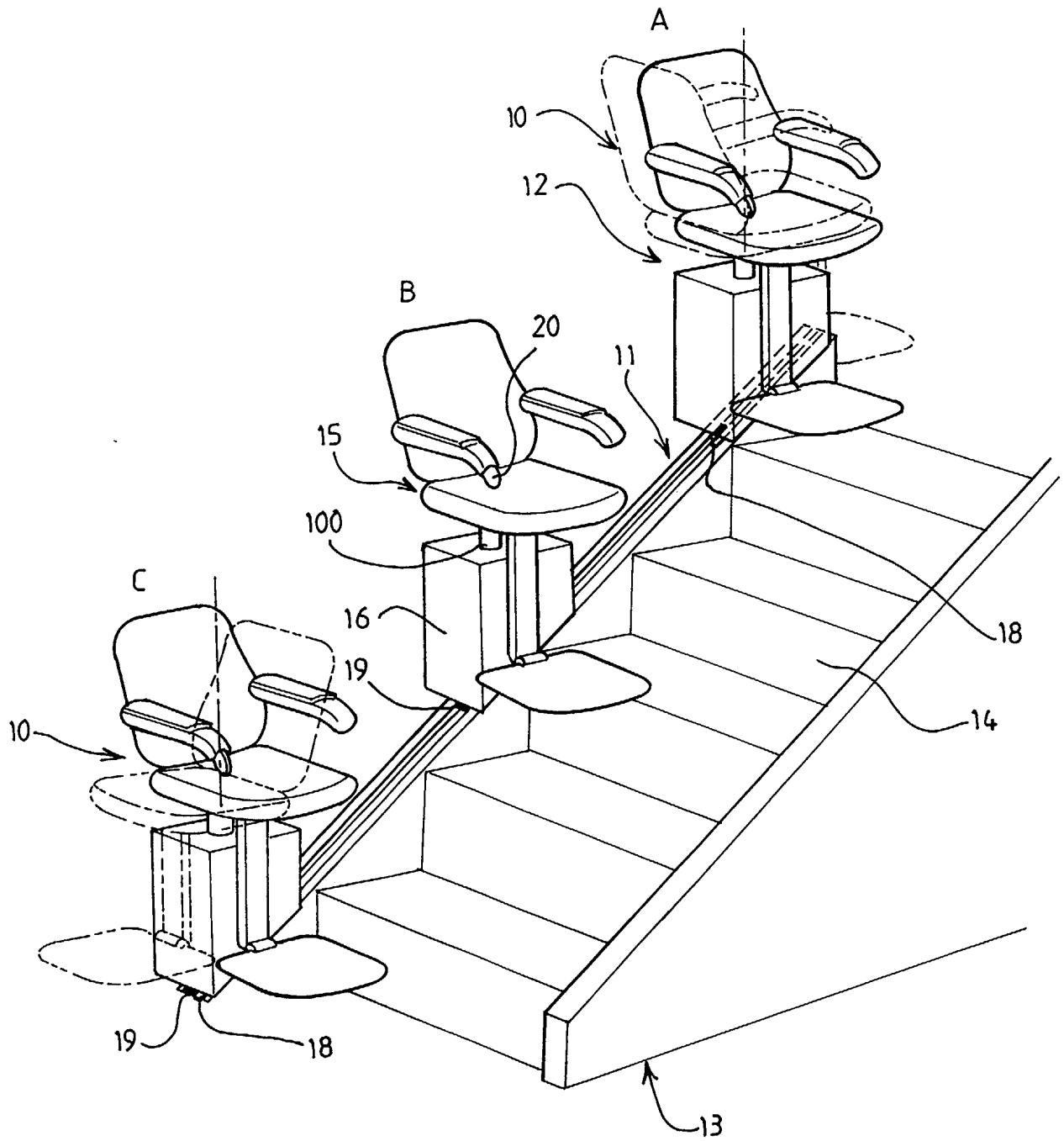


FIG 1

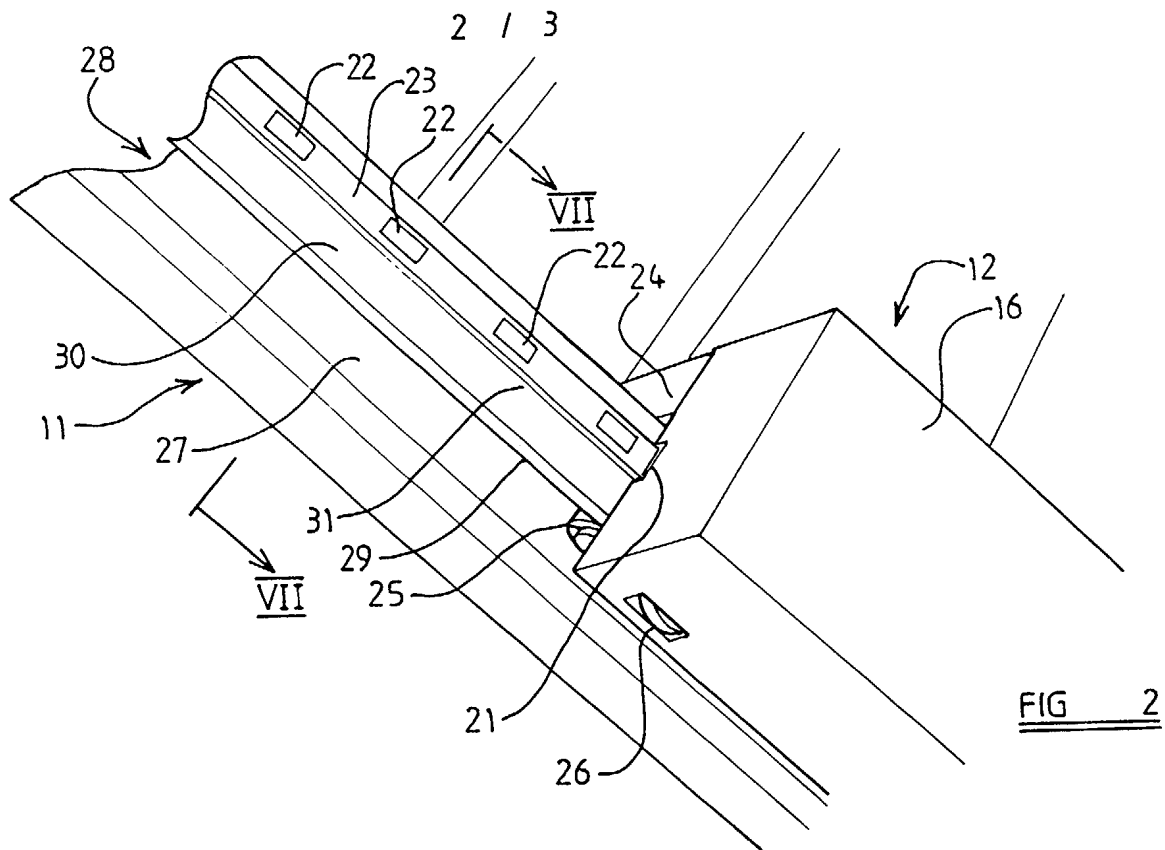


FIG 2

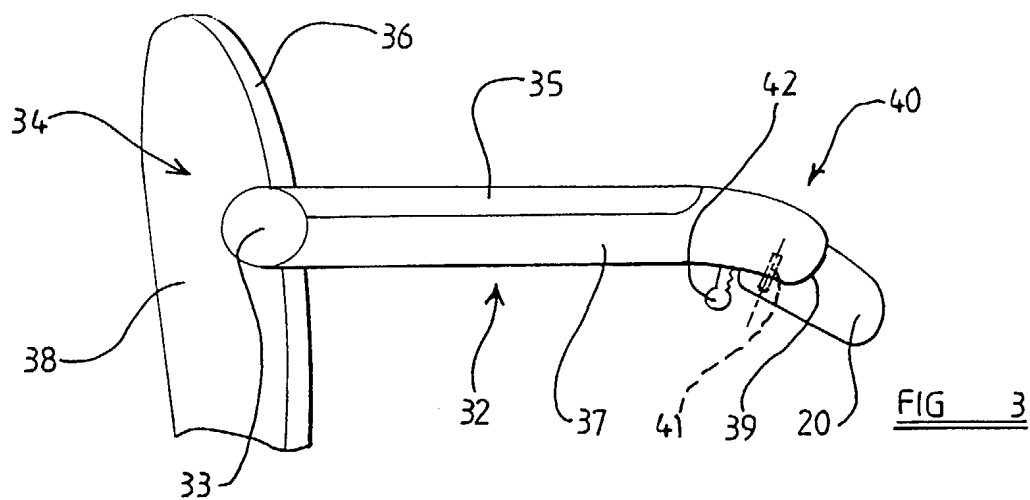


FIG 3

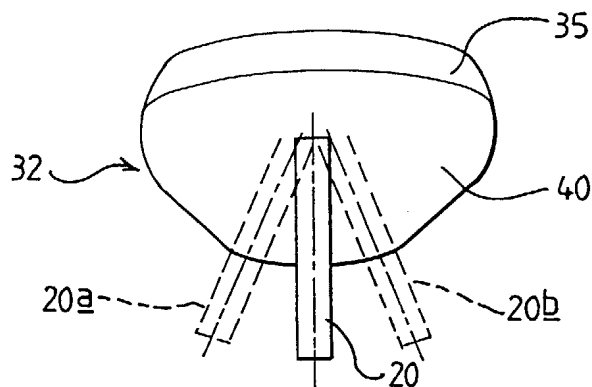


FIG 4

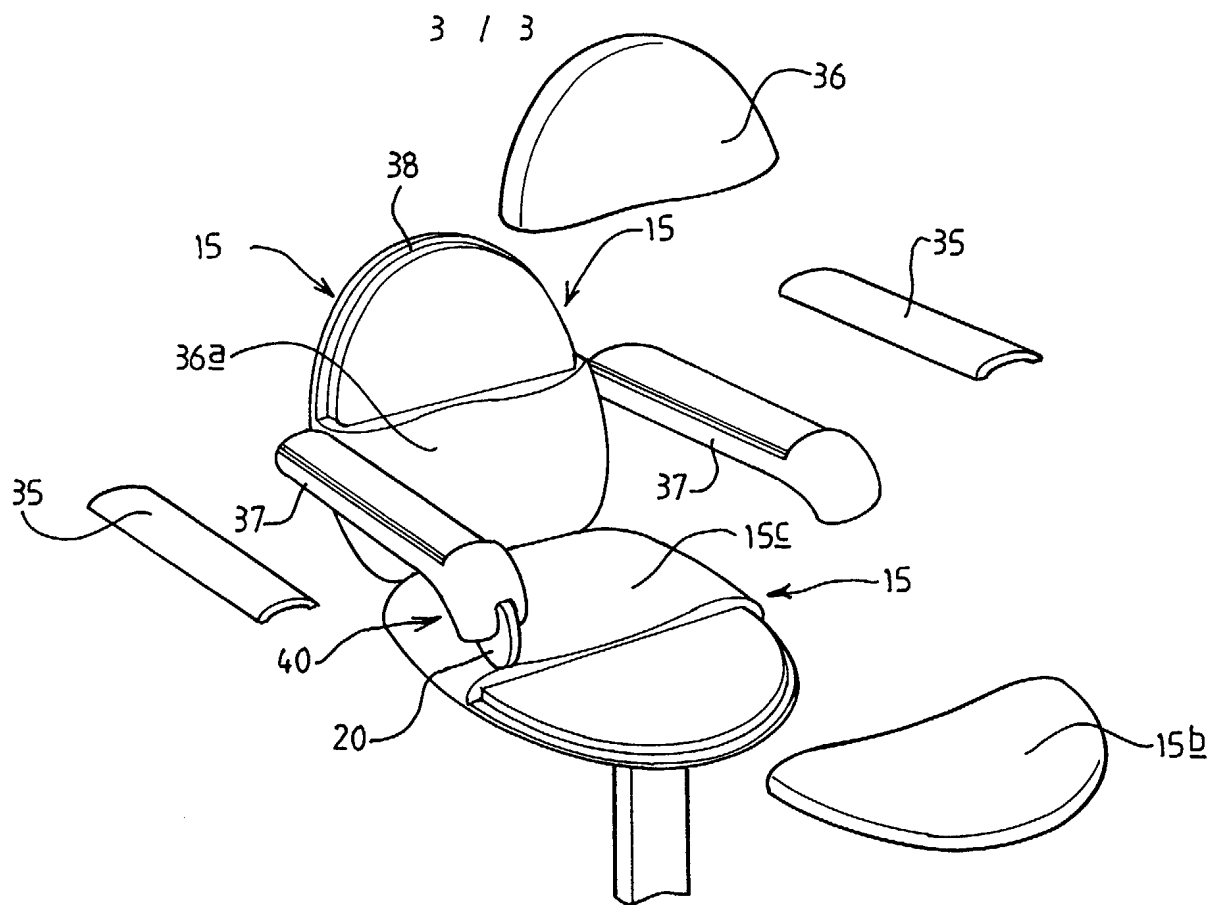


FIG 5

Title: A carriage for a stairlift assembly and a stairlift assembly.

Description of Invention

This invention relates to a carriage for a stairlift assembly of the kind having a track relative to which the carriage is moveable, and to a stairlift assembly of this general kind.

Stairlift assemblies of this general kind are used, for example, by the elderly or infirm to assist them in negotiating a flight of stairs, and typically comprise a track which is mounted on or secured to one side of the stairs, and a carriage which is moveable relative to the track, with the carriage supporting a seat part on which the user is positioned when the assembly is in use.

It is an object of the present invention to provide an improved carriage and stairlift assembly of this general kind.

In accordance with a first aspect of the present invention, there is provided a carriage for a stairlift assembly of the kind having a track relative to which the carriage is moveable, the carriage having a seat part which is powered so that powered angular movement thereof may be effected by a user.

The angular movement is preferably rotational movement, conveniently about a substantially upright axis, and the range of angular movement which may be effected may be limited.

The limited range of angular movement may be about 180°. Preferably, however, the limited range of angular movement is about 90°.

The range of angular movement may be limited by a mechanical stop provided on a part of the carriage.

The direction of angular movement which may be effected may be determined by the angular position of the seat part relative to the track.

Similarly, the angular movement of the seat part may be restricted or substantially prevented when the carriage is at certain positions relative to the track.

Preferably, the angular movement of the seat part is restricted or substantially prevented when the carriage is positioned between ends of the track. In this way, when the carriage is moving from one end of the track to the other, such as, for example, when the carriage is descending a flight of stairs, angular movement of the seat part is restricted or substantially prevented, thus reducing the risk of a user of the stairlift assembly falling or slipping from the seat part.

However, when the carriage is positioned at or closely adjacent the ends of the track, with these ends defining positions at which the user may wish to get on or off the seat part, angular movement of the seat part is permitted so that the seat part may be brought into a convenient position.

The movement of the carriage relative to the track may be effected by operating means, the angular movement of the seat part also being effected by said operating means.

The operating means may comprise an operating member, movement of the operating member effecting movement of the carriage and effecting angular movement of the seat part.

Preferably, the operating member comprises a toggle switch.

Control means is preferably provided whereby the angular position of the seat part relative to the track determines whether movement of the operating member effects movement of the carriage or effects angular movement of the seat part.

The position of the carriage relative to the track may be taken into account by the control means when determining whether movement of the operating member effects movement of the carriage or effects angular movement of the seat part.

The carriage may be provided with magnetic sensing means whereby the control means determines the position of the carriage relative to the track. The sensing means may comprise a reed switch, and the track may be provided with a plurality of magnets arranged along the track which bias the reed into a sensing condition.

The seat part may also be provided with sensing means whereby the angular position of the seat part relative to the track may be determined.

In accordance with a second aspect of the present invention, there is provided a stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage having a seat part which is powered so that powered angular movement thereof may be effected by a user. The seat part may comprise one or more of the features described herein.

The seat part may comprise a base part and a cushion part, the cushion part being releasably attached to the base part.

Preferably, the cushion part is attached to the base part by a hook and loop fastening means. Conveniently, the seat part comprises a plurality of cushion parts. In this way, a potential purchaser is able to select one or more particular cushion parts from a variety. Moreover, should a particular cushion part become damaged or dirty, and thus require replacement, removal of the affected cushion part is greatly facilitated by virtue of the releasable attachment.

In accordance with a third aspect of the present invention, there is provided a carriage for a stairlift assembly of the kind having a track relative to which the carriage is moveable, the carriage having a seat part comprising a base part and a cushion part, the cushion part being releasably attached to the base part.

In accordance with a fourth aspect of the present invention, there is provided a stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage having a seat part comprising a base part and a

cushion part, the cushion part being releasably attached to the base part. The seat part may comprise one or more of the features described herein.

Preferably, the cushion part is attached to the base part by a hook and loop fastening means.

The invention will now be described in greater detail, but by way of example only, by reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of a stairlift assembly, with the seat part of the carriage being shown in three different angular positions;

Figure 2 shows in more detail the engagement of the stairlift carriage with the track;

Figure 3 is a side view of an arm of a stairlift seat;

Figure 4 is an end-on view of the toggle switch shown in Figure 3, and

Figure 5 is a perspective view of a stairlift seat having a plurality of removable cushion parts.

Referring first to Figure 1, there is shown a stairlift assembly generally indicated at 10 having a track 11 and a carriage 12 which is engaged with the track 11 for sliding movement relative thereto. The assembly is mounted on a staircase 13, such that an elderly or infirm person, for example, may negotiate the stairs 14 by sitting on a seat 15 which is mounted on the carriage 12. The carriage 12 engages the track 11 by virtue of a rack and pinion arrangement with the rack being provided on the track 11, and with the pinion being provided on or within the carriage 12. The pinion is caused to rotate by an electric motor (not shown) housed within a motor housing 16, with the motor being powered by electricity supplied by one or more rechargeable batteries (also not shown) also contained within the motor housing 16. As is conventional, mains electrical power is supplied to the assembly via a step-down transformer positioned towards the bottom of the track 11, with direct current (D.C.) thus being supplied to electrical contacts 18, which, in the example shown, are located towards opposite ends of the track 11. The



carriage 12 is provided with a mutually configured contact generally indicated at 19, whereby direct current from the contacts 18 is supplied to the rechargeable batteries located within the motor housing 16.

During normal use of the stairlift, the motor is driven by electrical power supplied from the batteries, with the capacity of the batteries typically being such that ten to twenty ascents and descents may be achieved without recharging of the batteries being required. However, so that the assembly is always ready for use, with the batteries being charged to a satisfactory level, the carriage 12, when not in use, may be "parked" at a charging position, at which charging position the contacts 18 and 19 come into engagement, thus supplying electrical power to the batteries contained within the housing 16 of the carriage 12.

Figure 1 shows the carriage 12 in three different positions - A, B and C - with position A showing the carriage at the bottom of the track 11, position B showing the carriage towards the middle of the track, and position C showing the carriage at the top of the track. As shown in dotted outline, the seat 15 is mounted on a rotatable support 100 such that the support 100 and the seat 15 may be rotated about the substantially upright axis of the support 100 from a forward-facing position - illustrated at B - to a downward-facing position (shown in dotted outline at A), and to an upward-facing position (shown in dotted outline at C). This rotation, which in the example is limited to an arc of approximately 180°, facilitates getting on and off the seat 15 by a user, and improves the safety of the device, as the user is able to rotate the chair away from the stairs 14. As will be appreciated, this is particularly important when a user gets off the seat with the carriage at position C.

Referring next to Figure 3, this shows, in side view, one arm 32 of the seat 15, the arm 32 being pivotable relative to the back 34 of the seat 15 about an axis 33. Part of the uppermost surface of the arm 32 is provided with a removable cushion 35, the cushion 35, as with a back cushion 36, being

releasably attached to the plastics arm and back parts 37 and 38 by a number of hook and loop fasteners (not shown) to enable removal of the cushions for cleaning, for example.

A toggle switch 20, which has a cut-away part 39, is mounted for pivotal movement relative to a front part 40 of the arm 32 and is held in position by a pivot pin 41 which extends into a correspondingly configured bore 42 in the front part 40. The toggle switch 20 is electrically connected to the motor, such that movement of the switch effects sliding movement of the carriage 12 relative to the track 11. To prevent unauthorised use of the assembly, a key 42 may be provided, in generally conventional manner.

It can be seen from Figure 3 that the switch 20 lies well below the upper surface of the arm 32, meaning that inadvertent engagement of the switch 20 by a user is avoided, in contrast with previous constructions, which have a switch positioned on or near an upper surface of the front part 40.

As shown in Figure 4, the switch 20, which is considerably thinner than the front part 40 of the arm 32 to which it is pivotally mounted, may toggle between positions 20a and 20b, corresponding respectively to descending and ascending movement of the carriage 12. The switch may be operatively associated with a timing arrangement such as an electronic timing circuit, which allows movement of the carriage to commence only after a predetermined delay of between one and three seconds, during which delay the switch must remain engaged by the user, if movement of the carriage is to commence.

The toggle switch 20, in addition to being operative to effect movement of the carriage relative to the track, is also operative to effect rotation of the seat part 15 about the axis of the support 100. As rotational movement of the seat 15 is clearly undesirable at the same time as the carriage 12 is moving relative to the track 11, control means is provided within the motor housing 16 to determine whether movement of the toggle switch 20 should effect

movement of the carriage 12 relative to the track 11 or rotational movement of the seat 15 about the axis of the support 100. Whether rotational movement of the seat 15 or translational movement of the carriage 12 is effected by movement of the toggle switch 20 depends upon the position of the carriage 12 relative to the track 11, and on the angular position of the seat relative to the track.

To enable the position of the carriage 12 relative to the track 11 to be determined, the carriage 12 is provided with magnetic sensing means in the form of a reed switch 21, with the track 11 being provided with a plurality of magnets 22 which, in Figure 2, are positioned along the track 11 at approximately equidistant intervals. The magnets 22 are concealed from view by a removable plastics cover strip 23, and the magnetic interaction between the reed of the reed switch 21 and the succession of magnets 22 enables the electronic control means housed within the motor housing 16 to determine both the position and the direction of travel of the carriage 12. It will however be appreciated that other sensing means could conceivably be provided, conceivably of the type comprising micro-switches or the like, in which physical (i.e. actual) contact is made between the switches and the carriage 12.

In the example shown in Figure 1, the support 100, to which is mounted the seat 15, is rotatable relative to the motor housing 16, and there is provided within the motor housing 16 an angular sensing means which determines the angular position of the seat 15 relative to the carriage 12, and hence to the track 11, on which the carriage 12 is mounted for generally translational movement.

A typical operational cycle of the stairlift assembly is as follows. Starting with the seat in the position shown in dotted outline at A, at which getting on to the assembly is facilitated, the user moves the toggle switch 20 to the position shown in dotted outline at 20b in Figure 4 (i.e. to the user's left, from the user's perspective). The angular sensing means detects that the seat is angularly positioned away from the staircase and passes information on the

angular position to the electronic control means housed within the motor housing 16. The control means then ensures that movement of the toggle switch 20 to the position 20b results only in rotational movement of the seat 15 towards the position shown in solid outline at A in Figure 1, with no movement of the carriage 12 being effected relative to the track 11 at that time. During the rotational movement of the seat 15, the angular sensing means continually monitors the angular position of the seat relative to the carriage, and is operative to send a "stop" signal when the chair has rotated about the support 100 by approximately 90°, and hence has adopted the position shown in solid outline at A.

As a result of the stop signal, maintaining the toggle switch 20 at position 20b results in no further angular movement of the seat 15 and results - at that time - in no movement of the carriage 12 along the track 11. To initiate movement of the carriage 12 up the track 11, the user must release the toggle switch 20 (i.e. allow it to return, under spring bias, for example, to the central position shown in Figure 4) to reset the control means. Subsequently, movement of the switch 20 to the position 20b will effect sliding movement of the carriage 12 up the track 11, with no rotational movement being effected at that time. This ascending movement of the carriage 12 continues until the carriage reaches an upper part of the track 11, with this position being sensed by interaction of the reed switch 21 and the plurality of magnets 22 disposed along the track 11. Upon reaching the top of the track 11, the control means stops movement of the carriage 12, such that maintaining the switch 20 in position 20b results in no further movement of the carriage 12 relative to the track 11. The control means also inhibits rotational movement of the seat 15 until the system is reset by release of the switch towards the central position shown in Figure 4. Subsequently, movement of the switch to the position 20b effects only rotational movement of the seat 15 towards the position shown in

dotted outline at C, at which the user is able to get off the seat in a safe and convenient manner.

It will be appreciated that the “pause” between the end of the upward movement of the carriage 12 and the beginning of the angular movement of the seat 15 is important, as the user may not in fact wish the seat 15 to adopt the position shown in dotted outline at C upon reaching the top of the stairs. For example, there may be an obstruction such as an open door which could prevent the user from getting off the seat easily in the position shown in dotted outline, and the pause between the two types of movement thus gives the user an opportunity to get off the seat at the position shown in solid outline, if desired. Moreover, a combination of upward translational and rotational movement could result in a net force being exerted on the user which is directed away from the front of the seat, and which could thus unseat the user, with obvious adverse consequences.

Descending movement is controlled in much the same way, although the various sequences of operations will of course be reversed.

As an additional safety measure, rotation of the seat to the position shown in dotted outline at A may in fact be prevented by a mechanical stop provided, for example, on the support 100 or within the motor housing 16. This would prevent accidental rotation of the seat to that position during a descent which could conceivably arise as a result of an electronics failure prompted by a mains power surge, for example.

Movement of the carriage 12 along the track 11 is effected by a rack and pinion arrangement, of generally conventional type. The rack is provided in an extruded channel of the track 11, and the pinion is driven by a motor, with the pinion and motor being contained within the motor housing 16.

Rotation of the seat 15, in a preferred example, is accomplished by the use of a gear wheel, conveniently powered by the same motor as that which drives the carriage 12 along the track, the gear wheel engaging with a set of

circumferential teeth disposed around an outer surface of the support 100, with the gear wheel/teeth assembly being contained within the motor housing 16. Alternatively, it is envisaged that a belt-drive system could conceivably be used, and that as a further alternative, an actuating lever could be caused to bear upon a part of the seat 15 in order to effect rotation.

To improve further the comfort of a user during operation of the stairlift, electronic brake circuitry is contained within the motor housing 16, the brake being operative gradually to slow movement of the carriage 12 as it approaches a predetermined position, such as an end of the track 11. As previously described, the position and the direction of travel of the carriage 12 relative to the track 11 may be determined by electronic control means linked to a succession of magnets 22 and a reed switch 21, and the electronic brake circuitry may therefore be effective to operate once the electronic control means has determined that a particular, predetermined, position of the carriage 12 has been arrived at. The brake may act directly on a part of the carriage such as the pinion such that rotation of the pinion is slowed by frictional forces exerted thereupon by the brake. Alternatively, the brake could be caused to act upon a bearing surface of the track 11. In a preferred embodiment, however, the brake is operative gradually to reduce the electrical power supplied to the motor which moves the carriage 12 relative to the track 11, meaning that subsequent to release of the switch 20 by the user of the stairlift, movement (either ascending or descending) of the carriage 12 is slowed gradually until the carriage 12 is brought completely to rest, making use of the stairlift more comfortable for the user.

Turning next to Figure 5, this shows in more detail the seat 15 of Figure 1, and illustrates in particular the arrangement of cushion parts which is provided. In the example, a horizontal seat part 15a is provided with two cushions 15b and 15c, with a back support part 15d being provided with a pair of cushions 36 and 36a. Each of these cushions 15b, 15c, 36 and 36a, in

addition to the arm cushions 35, are releasably attached to the plastics body of the seat by one or more hook and loop fasteners such as are known commercially by the registered trade mark Velcro, to facilitate removal - and subsequent re-attachment - of the cushions as may be required for cleaning purposes, for example. The provision of releasably attachable cushions also enables a potential purchaser of the stairlift to select certain cushions from an available range, and thus enables the user to tailor the aesthetic properties of the seat, as required. Moreover, for persons suffering from back problems, the interchangeable cushion arrangement enables a user to attach specifically designed cushions having orthopaedic or lumbar support properties, as and when the user's needs so require. With currently available stairlift seats, the user can only place (i.e. rest) lumbar support cushions on the seat assembly, which is inconvenient and unsatisfactory, as precise positioning of the lumbar support is difficult to achieve.

The cushions are preferably formed from an expanded foam material, and are provided on their outer surfaces with a water resistant or waterproof plastics material.

In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

## CLAIMS:

1. A carriage for a stairlift assembly of the kind having a track relative to which the carriage is moveable, the carriage having a seat part which is powered so that powered angular movement thereof may be effected by a user.
2. A carriage according to claim 1 wherein the angular movement is rotational movement.
3. A carriage according to claim 1 or claim 2 wherein the range of angular movement which may be effected is limited.
4. A carriage according to claim 3 wherein the range is about  $180^{\circ}$ .
5. A carriage according to claim 3 wherein the range is about  $90^{\circ}$ .
6. A carriage according to any one of the preceding claims wherein the direction of angular movement which may be effected is determined by the angular position of the seat part relative to the track.
7. A carriage according to any one of the preceding claims wherein angular movement of the seat part is restricted or substantially prevented when the carriage is at certain positions relative to the track.
8. A carriage according to any one of the preceding claims wherein angular movement of the seat part is restricted or substantially prevented when the carriage is positioned between ends of the track.



9. A carriage according to any one of the preceding claims wherein the movement of the carriage relative to the track is effected by operating means, and wherein the angular movement of the seat part is also effected by said operating means.

10. A carriage according to claim 9 wherein the operating means comprises an operating member, movement of the operating member effecting movement of the carriage and effecting angular movement of the seat part.

11. A carriage according to claim 10 wherein the operating member comprises a toggle switch.

12. A carriage according to claim 10 or claim 11 wherein control means is provided whereby the angular position of the seat part relative to the track determines whether movement of the operating member effects movement of the carriage or effects angular movement of the seat part.

13. A carriage according to claim 12 wherein the position of the carriage relative to the track is taken into account by the control means when determining whether movement of the operating member effects movement of the carriage or effects angular movement of the seat part.

14. A stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage having a seat part which is powered so that powered angular movement thereof may be effected by a user.

15. A stairlift assembly according to claim 14, the seat part being in accordance with any one of claims 1 to 13.

16. A carriage according to any one of the preceding claims wherein the seat part comprises a base part and a cushion part, the cushion part being releasably attached to the base part.

17. A carriage according to claim 16 wherein the cushion part is attached to the base part by a hook and loop fastening means.

18. A carriage according to claim 16 or claim 17 wherein the seat part comprises a plurality of cushion parts, each of which being releasably attached to the base part.

19. A carriage for a stairlift assembly of the kind having a track relative to which the carriage is moveable, the carriage having a seat part comprising a base part and a cushion part, the cushion part being releasably attached to the base part.

20. A carriage according to claim 19, the seat part being in accordance with claim 17 or claim 18.

21. A stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage having a seat part comprising a base part and a cushion part, the cushion part being releasably attached to the base part.

22. A carriage for a stairlift assembly substantially as hereinbefore described and/or as shown in the accompanying drawings.

23. A stairlift assembly substantially as hereinbefore described and/or as shown in the accompanying drawings.

24. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.



INVESTOR IN PEOPLE

**Application No:** GB 0019565.1  
**Claims searched:** 1 to 18

**Examiner:** Trevor Berry  
**Date of search:** 28 February 2002

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK CI (Ed.T): B8L (LB)  
Int CI (Ed.7): B66B 9/08  
Other: ONLINE: EPODOC, JAPIO, WPI

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2322450 A JONES	
X	US 5992935 REUS-note col 7 line 60 to col 8 line 3	1-4,14
A	US 5720364 STANNAH	
X	US 5052521 CHENEY CO.-note col 9 lines 18 to 56	1-3,5,14

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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